ACTIVITY 1

LIFESTYLES AND THE ENVIRONMENT

This activity demonstrates that our lifestyles are supported by complex industrial activities that consume vast quantities of natural resources and result in large quantities of air pollution. As the population grows and the standard of living increases, the consumption of resources and emission of pollutants also increase. These trends have significant implications for the lifestyles of students and their families. This activity is related to the warm-up exercise called "Making Decisions." Related activities include "Deciding To Clean the Air" and "Choosing a Better Future."

CRITICAL OBJECTIVES

- Distinguish between renewable, non-renewable, and recyclable resources
- Recognize the impact that lifestyle changes have had on the level of industrial activities that cause air pollution
- Recognize the relationship between population and consumption
- Understand the effect of supply and demand on the price of resources
- Identify ways to use less resources and to reduce air pollution

SKILLS

- Graphing
- Comparing data
- Defining problems
- Drawing conclusions

GUEST PRESENTERS

Guest presenters could include conservationists, economists, environmental scientists, or EPA environmental protection specialists.

BACKGROUND

The manufacture and consumption of many goods and services results in the production of pollution as a side effect. Much pollution, if not controlled, can cause diseases in humans and other species, as well as property damage. In addition, these air pollutants can cause changes in the Earth's climate that may make it more difficult and, therefore, more costly to produce food and the resulting melting of polar icecaps may cause the sea level to rise to dangerous levels.

RELATED WARM-UP
G

REFER TO READING MATERIALS
"Air Pollution"
"The Greenhouse Effect"
"Automobiles and Air Pollution"

TARGET GRADE LEVEL
9th - 12th

DURATION
40 minutes in class #1, with a take-home assignment;
40 minutes in class #2

VOCABULARY
Free good
Non-renewable resource
Raw material
Recyclable resource
Renewable resource
Scarce good
Supply and demand

MATERIALS
Chalk
Chalkboard
Two student worksheets

WORKSHEETS INCLUDED
2

There have always been pollutants in the atmosphere, both from natural and human sources. The most important human source is combustion of fuels (wood, coal, natural gas, petroleum) for transportation, heating and cooling, electricity generation, and manufacturing. In the past, human sources represented just one of many sources of pollutants. However, the importance of human sources has increased in recent years because of several developments:

- The products we use in our everyday lives (automobiles, electric equipment) have been growing more and more sophisticated, thereby requiring more industrial processes that emit large quantities of pollutants. Some chemicals are toxic even in small amounts.
- The per person consumption of goods and services has increased substantially.
- The U.S. and world populations have increased substantially over the past 100 years.

Because the Earth's atmosphere is a finite size, it will not sustain the continued growth of the current patterns of consumption. The following are among options available to us:

- Continue our current practices: this strategy ultimately might result in a crisis sometime in the future.
- Change our consumption patterns and, as necessary, our lifestyles to use fewer resources and use resources that pollute less.
- Improve our technology so we can produce the materials and offer the services we want with fewer resources. For example, a solid state radio may consume less steel, plastic, and glass, and use less electricity, than an old vacuum-tube-based radio, and more efficient electronic data communications may lead to a reduction of travel, because many people can work at home several days a week.

WHAT TO DO

Class #1

1. Distribute the student handout called "Major Man-Made Air Pollutants." Review the sources and the basic health and environmental effects of air pollution with the class.

2. Present and discuss the concepts of a "free good," "scarce good," "supply and demand," "renewable," "non-renewable," and "recyclable" resources. After defining each concept, ask the class for examples.

3. Put the following table on the chalkboard and assign a student to fill it in as the class discussion progresses. Have the class list things they currently have (such as a car, TV, Walkman, Nintendo) and their typical activities (such as traveling to school, playing softball, going to the movies). Then list the associated raw materials and direct and indirect pollutants. (The first entry is provided as an example.)

Current Goods and Activities	Raw Materials Required	Pollutants Directly Resulting	Pollutants/Activities Indirectly Resulting
Driving to school	Fuel, oil, lubricants	CO_2, NOx, lead, hydrocarbons	Steel, rubber, glass, electricity to manufacture car

4. Put a second table (shown below) on the chalkboard and assign a student to fill it in as before. Have the class list things they would like to have and activities they would like to undertake in the future. Then, list the associated raw materials and pollutants. (A call to local manufacturing companies prior to the class may be useful in helping students with the quality and quantity of the information.)

Future Goods and Activities	Raw Materials Required	Pollutants Directly Resulting	Pollutants/Activities Indirectly Resulting

5. Compare the two tables. Ask the class what conclusions they can draw from the comparison and speculate about the implications for our store of raw materials and pollution.

6. Distribute the student worksheet called "Growth in the Use of Critical Resources," which provides examples of historical trends in consumption of raw materials, as well as trends of population and energy consumption. Have students enumerate products and activities in our daily lives that use these materials and speculate what the future consumption of these materials might be. In discussing the data in the table, you may note the following as needed:

- Per capita use of lumber has been declining. This decline was caused by several factors: Diminishing supply and relative to the growing population, substitution of other materials such as plastics and metals for wood, and increased price of wood over time.

- Although the United States accounts for 26 percent of world petroleum consumption, it is only 5 percent of the world population. If per capita consumption does not change, the U.S. would consume 26.8 million barrels of oil per day, which is about 26 percent of current annual production. It is not known whether there is enough petroleum in the ground to increase world production substantially higher than current production.

- The per person consumption of steel and aluminum decreased from

1960 to 1990. This is not necessarily indicative of the long-term trend. During this period, imports of products such as automobiles and electrical and electronic equipment that contain these metal have also increased.

7. Assign different students or teams of students to take a different raw material and prepare a graph illustrating the data on the handout and their projections for the future.

Class #2

1. Review the graphs prepared in the previous class.

2. Have the class discuss potential problems if we continue our current consumption and production patterns. Focus the discussion on the following questions:
   What does this imply for the prices and availability of the goods you want?
   If you earned a fixed amount each month, would you be able to afford all the things you want?
   If everyone could afford all the things they wanted in the future, what would happen to air quality?

3. Ask for ideas on how we could reduce these problems and obtain the things we want. If necessary, prompt students with the following:
   Change our desires?
   Change how products are designed to use fewer resources and pollute less (smaller cars, simpler packaging of consumer products)?
   Use more recyclables and renewable materials?
   Reduce consumption of fuels for transportation, heating, and cooling?

SUGGESTED EXTENSIONS (OPTIONAL)

- Give students a library assignment to compare the energy use of different models of cars. Include small, medium, large, sports, "muscle" and utility vehicles, and vans. They can estimate the average miles driven per year by their families, compare these to National averages, and look up EPA fuel consumption estimates for specific car models. (*Consumer Reports,* which is available at most libraries, publishes this information in the April edition each year.) Have them do the calculations in both gallons of fuel and dollars per year. Then have them discuss the following questions:
  If the cost of gasoline doubles by the year 2004, will you buy a different car?
  What characteristics of the car (size, comfort, acceleration, safety) would you be willing to trade for better fuel consumption?

- Ask the students to take an inventory of their families' energy use for a typical week (or year) using the student worksheet called "Family Resource Use." Have them take the worksheet home, fill it in with their family's help, and bring it back to class. After the worksheets have

been completed, have students discuss the reasons for differences and how their families could improve their resource use. (To facilitate this discussion, you may want to divide students into groups according to the type of fuel used, then record the fuel usage on the chalkboard for heating, cooling, and water heating. Within each group, have students discuss differences by referring to the other factors on the worksheet such as insulation, storm windows and doors, and the use of set-back thermostats.)

☼ Ask students to look up in the library, or in articles you may supply, the energy required (in kilowatt-hours) and the air pollution emitted (in pounds or tons) in the manufacture a ton of aluminum, steel, and paper.

SUGGESTED READING

Bright, Michael. *Traffic Pollution*. New York, NY: Gloucester Press (1991).

"Green, Greener, Greenest." *Economist*, 311 (6 May 1989) p. 67.

"A Guilt-Free Guide to Garbage." *Consumer Reports* (February 1994) p. 91.

Lowe, Marcia D. "Reinventing the Wheel: From Denmark to Japan." *Technology Review*, 93 (May 1990) p. 60.

Rauber, Paul. "Key to Gridlock? The Free Ride Goes the Way of the Free Lunch." *Sierra*, 79 (March 1994) p. 45.

"Recycling, Is It Worth the Effort?" *Consumer Reports* (February 1994) p. 92-98.

Saunders, Linda. "Uneasy Riders (Cars and Pollution)." *Health*, 22 (February 1990) p. 46.

Stambler, Irwin. "'We Can Meet Energy Needs and Not Destroy Our Environment' (William Ruckelshaus Tells Engineers)." *Research and Development*, 30 (September 1988) p. 32.

What You Can Do To Reduce Air Pollution. Washington, DC: U.S. Environmental Protection Agency EPA/450/K-92/002 (1992).

"Where Household Goods Go." *Consumer Reports* (February 1994) p. 99-100.

Wood, Daniel S. "L.A. Sends Its Workers Home—To Work." *Christian Science Monitor*, 86 (1 December 1993) p. 7.

STUDENT WORKSHEET 1

LIFESTYLES AND THE ENVIRONMENT

GROWTH IN USE OF CRITICAL RESOURCES

TAPE SID'S TABLE HERE

STUDENT WORKSHEET 2
LIFESTYLES AND THE ENVIRONMENT

FAMILY RESOURCE USE

Use the following questions and table to record your family's energy use for a typical year or week. This information is most likely available in your home. Discuss it with your family.

Home Heating:
Indicate the followin:
Type of fuel (for example, oil, natural gas, coal) _____
Volume used last year (in gallons, cubic feet, therms, or other measure) ____
Cost last year $____
Do you use a set-back thermostat? ___,
Days of the week are they used? ____, hours used? ____
Size of your house in square feet, not including garage, basement, or unfinished attic ____

Water Heating:
Indicate the following:
Type of fuel (for example, natural gas, electricity) _____
Do you use a set-back thermostat? ___,
Days of the week are they used? ____, hours used? ____
Size of water heater in gallons ____

Home Cooling:
Indicate the following:
Type of fuel (for example, natural gas, electricity) _____
Volume used last year (in cubic feet, therms, or kilowatt hours) ____
Cost last year $____
Do you use a set-back thermostat?
Days of the week are they used? ____ hours used? ____
Size of your house in square feet, not including garage or basement _____

Home Insulation:
Indicate the following:
Roof insulation Material (for example fiberglass, rockwool, cellulose, none)_____
Roof insulation thickness (for example, 3.5 inches, 6 inches, 7.5 inches) ____
Wall insulation material (for example fiberglass, rockwool, cellulose, none) _____
Wall insulation Thickness (for example, 3.5 inches, 6 inches, 7.5 inches) ____
Type of wall (for example, masonry, wood frame) _____
Do most of the windows have storm windows? ____
Do most of the windows have double glazing (two pains of glass separated by an air space)?
____

Recycling:
What products do you recycle in your home (plastic, aluminum foil, aluminum cans, steel cans, plastic jars and bottles, newspaper, other paper)?

_____

Travel:
How do you get to school (school bus, public transportation, auto, car pool)?

_____
Distance from house to school? _____ How long would it take to walk? _____, Bike? ____, Skate? ____
How do your other family members travel to school or work? ____
What other methods might they use?_____ Why are these not used?

_____